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Abstract

PROBLEM TO BE SOLVED: To effectively prevent generation of the buckling of a hose body by interposing an adhesive layer between reinforcement layers, between the reinforcement layer and an inner layer and between the reinforcement layer and an outer layer in a hose provided with at least one reinforcement layer consisting of synthetic fiber between the inner layer and the outer layer consisting of a thermoplastic resin.
SOLUTION: In a hose body 5 to be used in the hydraulic equipment, two reinforcement layers 8a, 8b of spiral structure which consists of, for example, no-twist or soft-twist polyester fiber yarn whose number of twist is <=10/10cm. An adhesive layer 9 consisting of, for example, polyurethane adhesive is interposed between the reinforcement layers 8a, 8b and between the reinforcement layers 8a, 8b and the inner layer 6 and the outer layer 7, and integrated with each other. Generation of the buckling of the hose body 5 is effectively prevented during the assembly work of the hose, the reinforcement efficiency is improved, and the productivity is also improved.

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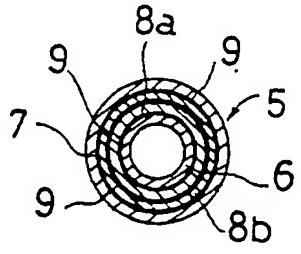
(54)【発明の名称】　ホース

(57)【要約】

【課題】　ホースの組付け作業時にホース本体の座屈の発生を有効に防止出来ると共に、補強効率を向上させ、更に生産性の向上を図ることが出来るホースを提供することを目的とする。

【解決手段】　補強層８ａ，８ｂ間及び補強層８ａ，８ｂと内面層６及び外面層７との間に、接着剤層９を介在させて一体的に構成したものである。なお、この実施形態では、内面層６と外面層７との間に、２層の補強層８ａ，８ｂを設けてあるが、３層以上の補強層を接着剤層９を介して設けても良い。



【特許請求の範囲】
【請求項１】　熱可塑性樹脂材料により構成した内面層と外面層との間に、合成繊維からなる補強層を少なくとも一層以上設けたホースにおいて、前記補強層間及び補強層と内面層及び外面層との間に接着剤層を介在させて一体的に形成したことを特徴とするホース。
【請求項２】　前記補強層が、スパイラル構造である請求項１に記載のホース。
【請求項３】　前記補強層が、無撚りまたは甘撚りあって、その繊維の撚り数が１０回／１０ｃｍ以下である請求項１または請求項２に記載のホース。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】この発明は、油圧機器類に使用されるホースに係わり、更に詳しくはホースの組付け作業時にホース本体の座屈の発生を有効に防止出来ると共に、補強効率を向上させ、更に生産性の向上を図ることが出来るホースの改良に関するものである。
【０００２】
【従来の技術】従来、油圧機器類に使用されるホースには、図３に示すように、熱可塑性樹脂材料により構成した内面層１と外面層２との間に、合成繊維材料により構成されたブレード構造の補強層３を少なくとも一層以上設けたホース４が使用されている。
【０００３】
【発明が解決しようとする課題】然しながら、近年では上記のようなホース４を使用する油圧機器類は、軽量化，コンパクト化，高性能化等により配管スペースが狭くなり、該ホース４の組付け時にホース４が座屈すると言う問題があった。この要因としては、補強層間及び補強層と内面層及び外面層とが一体化されておらず、従って、座屈の発生点が多いからであると考えられる。
【０００４】また、従来の補強層３は、ブレード構造であるため、繊維糸同志の交差があり、補強層編組時の繊維のフィラメント切れが発生し、補強効率が低下すると共に、編組機が高速運転出来ないため、生産性の向上を図ることが出来ないと言う問題があった。この発明は、かかる従来の課題に着目して案出されたもので、複数の補強層間及び補強層と内外樹脂層とを接着剤層を介して一体化させることにより、ホースの組付け作業時にホース本体の座屈の発生を有効に防止出来ると共に、補強効率を向上させ、更に生産性の向上を図ることが出来るホースを提供することを目的とするものである。
【０００５】
【課題を解決するための手段】この発明は上記目的を達成するため、補強層間及び補強層と熱可塑性樹脂材料により構成した内面層及び外面層との間に接着剤層を介在させて一体的に形成したことを要旨とするものである。また、前記補強層が、スパイラル構造であり、更に補強層が、無撚りまたは甘撚りあって、その繊維の撚り数が１０回／１０ｃｍ以下に設定するものである。
【０００６】この発明は上記のように構成され、複数の補強層間及び補強層と内外樹脂層とを接着剤層を介して一体化させることにより、座屈発生点が小さくなり、また補強層をスパイラル構造にすることで、補強繊維のフィラメント同志の接触点が小さくなるため、座屈発生点は小さくなり、従って、ホースの組付け作業時にホース本体の座屈の発生を有効に防止することが出来ると共に、補強効率を向上させ、更に編組機の高速運転が可能であるため、生産性の向上を図ることが出来るものである。
【０００７】
【発明の実施の形態】以下、添付図面に基づき、この発明の実施形態を説明する。図１は、この発明を実施したホース本体５の一部切欠した斜視図を示し、このホース本体５は、熱可塑性ポリエステルエラストマー等の熱可塑性樹脂材料から成る内面層６と、熱可塑性ポリウレタン，熱可塑性ポリエステルエラストマー等の熱可塑性樹脂材料から成る外面層７との間に、無撚りまたは甘撚りのポリエステル繊維糸で、その繊維糸の撚り数が１０回／１０ｃｍ以下であるスパイラル構造の補強層８ａ，８ｂが２層形成してある。
【０００８】なお、熱可塑性樹脂材料の好ましいショアＤ硬度は、内面層では４０～６３，外面層では３２～５０である。この発明では、特に補強層８ａ，８ｂ間及び補強層８ａ，８ｂと内面層６及び外面層７との間に、例えば、ポリウレタン系接着剤から成る接着剤層９を介在させて一体的に構成したものである。
【０００９】なお、この実施形態では、内面層６と外面層７との間に、２層の補強層８ａ，８ｂを設けてあるが、３層以上の補強層を接着剤層９を介して設けても良い。なお、上記補強層８ａ，８ｂの繊維の撚り数が１０回／１０ｃｍを超えてくると、繊維束の偏平度が下がり、補強層８ａ，８ｂ間及び補強層８ａ，８ｂと内面層６または外面層７との間の距離は次第に離れて行き、互いの接着力も次第に減少し、好ましくない状態になって来る。従って、繊維の撚り数が１０回／１０ｃｍ以下であることが好ましいのである。
【００１０】次に、従来のブレード構造の補強層を備えたホースと、スパイラル構造の補強層を備えたこの発明のホースとのホース曲げ試験と、その試験結果について説明する。
〔実験条件〕
１．ホースの仕様
(a)．内径：5.0 mm，外径：9.0 mm
(b)．ホース材料
内面層：熱可塑性ポリエステルエラストマー（硬度，ショアD 55° ～47° ）
外面層：熱可塑性ポリウレタン（硬度，ショアD 40° ）または熱可塑性ポリエステルエラストマー（硬度，ショ

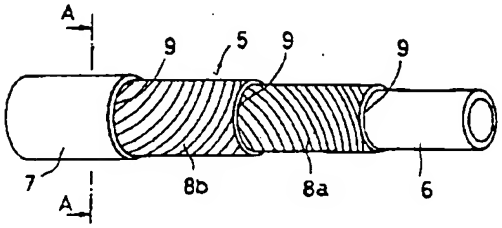
アD 40°)
補強糸：撚り数が５（回／10cm）のポリエステル繊維糸(1,500d)
接着剤：ポリウレタン系接着剤（TB：40Kgf/cm^2, 破断伸び：380%)
補強層の編組角度：109 ° 30'
ブレード構造：24c ×2P,(72,000d),
スパイラル構造：24c ×1P×2 層(72,000d)
内面層寸法：Φ5.0(内径) ×1.0t（肉厚）×Φ7.0(外径)
外面層寸法：1.0t(肉厚) ×Φ9.0(外径)
２．試験結果
ホースの曲げ試験結果は、以下の表１に示す。
【００１１】
【表１】

表　1

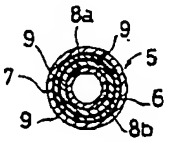
	比　較　例	実施例　1	実施例 2	実施例 3	実施例 4
補強層の構造	ブレード	スパイラル	スパイラル	スパイラル	スパイラル
内面層材料,ショD 硬度	ポリエステル(55 °)	ポリエステル(55 °)	ポリエステル(55 °)	ポリエステル(47 °)	ポリエステル(47 °)
外面層材料,ショD 硬度	ウレタン (40 °)	ウレタン (40 °)	ポリエステル(40 °)	ウレタン (40 °)	ポリエステル(40 °)
内面層上の接着剤	あり	あり	あり	あり	あり
補強層上の接着剤	あり	あり	あり	あり	あり
補強層間の接着剤	不可	あり	あり	あり	あり
座屈点（mm）	２１	４０	４２	４１	４４

【００１２】ホースの曲げ試験は、図４（ａ）～（ｃ）に示すのように、５０mmの支点Ｐ間に試験ホースを水平に載置し、支点間の中央を、基準位置Ｘ－Ｘから押圧棒Ｚにより垂直方向に荷重をかけ、図４（ｃ）に示すように、ホースが座屈するまでの座屈点Ｓ（距離）を測定した。
【００１３】測定結果から明らかなように、複数の補強層間及び補強層と内外樹脂層とを接着剤層を介して一体化させることにより、座屈発生点が小さくなり、また補強層をスパイラル構造にすることで、補強繊維のフィラメント同志の接触点が小さくなるため、座屈発生点は小さくなった。
【００１４】
【発明の効果】この発明は、上記のように複数の補強層間及び補強層と内外樹脂層とを接着剤層を介して一体化させて構成するので、座屈発生点が小さくなり、また補強層をスパイラル構造にすることで、補強繊維のフィラメント同志の接触点が小さくなるため、座屈発生点は小さくなり、従って、ホースの組付け作業時にホース本体の座屈の発生を有効に防止することが出来ると共に、補強効率を向上させ、更に編組機の高速運転が可能であるため、生産性の向上を図ることが出来る効果がある。
【図面の簡単な説明】
【図１】この発明を実施したホース本体の一部切欠した斜視図である。
【図２】図１のＡ－Ａ矢視断面図である。
【図３】従来のブレード補強層を備えたホースの一部切欠した斜視図である。
【図４】（ａ）～（ｃ）は、ホースの曲げ試験方法の説明図である。
【符号の説明】
５　ホース本体　　６　内面層
７　外面層　　８ａ，８ｂ　補強層
９　接着剤層

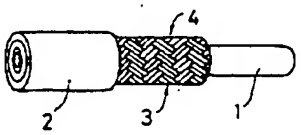
【図１】



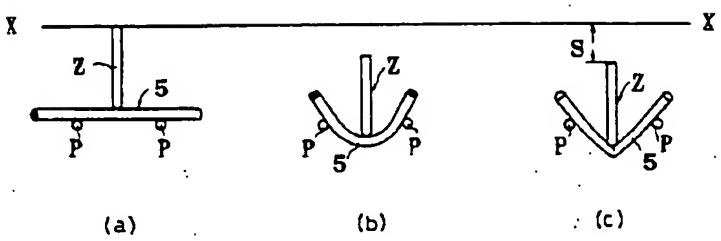
【図２】



【図３】



【図４】



(a) (b) (c)

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B 32 B 1/08	B 32 B 1/08	B

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(54) **[Title of Invention] Hose**

(57) **[Summary]**

[Problem] To provide a hose which effectively prevents occurrence of buckling in a hose when the hose is being attached. At the same time, the reinforcing efficiency of the hose is upgraded and its productivity can be further upgraded.

[Means Used to Resolve This] The hose is configured by interposing a layer 9 made of an adhesive agent between (a) a reinforcing layer 8a and a reinforcing layer 8b; and (b) these reinforcing layers 8a and 8b and an interior layer 6 and an exterior layer 7 so that a single integrated piece is formed. Further, in this working of the present invention, two reinforcing layers 8a and 8b are set in place between the interior layer 6 and the exterior layer 7; however, three or more reinforcing layers may be set in place using the layer 9 made up of the adhesive agent.

Specification

[Scope of Patent Claim]

[Claim 1] A hose which is formed of an integral piece in which at least one or more reinforcing layers made of synthetic fibers are placed between an interior layer and an exterior layer which are configured of a thermoplastic resinous material, the invention being characterized as interposing a layer made of an adhesive agent between the aforementioned reinforcing layers; and between these reinforcing layers and the interior layer and the exterior layer;

[Claim 2] The composition of Claim 1 in which the aforementioned reinforcing layer has a spiral structure;

[Claim 3] The composition of Claim 1 or Claim 2 in which the aforementioned reinforcing layer is made of untwisted or soft twist fiber with a twist count of 10 times / 10 cm and below.

[Detailed Description of Invention]

[0001] The present invention relates to a hose which is used for hydraulic equipment and in particular to an improved hose which makes it possible to effectively prevent the occurrence of buckling and which at the same time upgrades the reinforcing efficiency which further upgrades productivity.

[0002]

[Description of the Prior Art] In prior art hoses which were used in hydraulic machinery, the hose was made up of at least three or more reinforcing layers with a braided structure which was configured of a synthetic fiber material, the layers being placed between an interior layer 1 and an exterior layer 2 which were configured of a thermoplastic resinous material, as indicated in Figure 3.

[0003]

[Problems Which the Present Invention Attempts to Resolve] In recent years, however, hydraulic equipment which used hose 4 which was described previously took up less and less space due to a trend toward lighter, more compact and more high performance machines and there were problems in that the hose 4 buckled while it was being assembled. The main reason for this was the fact that the space between (a) the reinforcing layers; and (b) the space between these reinforcing layers and the interior layer and the exterior layer did not form an integral part. As a result, there were many instances of buckling.

[0004] There were other problems in that the prior art reinforcing layer 3 was braided so that there were crossovers among the fiber threads and breaking of the fiber filaments when the reinforcing layers were being braided. The reinforcing efficiency declined and at the same time, the braiding machine was no longer able to run at high speeds so that the productivity could not be upgraded. The present invention was devised to take into consideration these problems in the prior art It is an object of the present invention to provide a hose which makes it possible to

efficiently prevent the occurrence of buckling in the main body of the hose which occurs while the hose is being assembled and at the same time, which upgrades the reinforcing efficiency and further upgrades the productivity by using an integrated structure in which the multiple reinforcing layers and the space between these reinforcing layers and the interior and exterior resinous layers are integrated using a layer made up of an adhesive agent.

[0005]
[Means Used to Resolve These Problems] The present invention has attained the aforementioned objectives by [two characters illegible] forms an integral piece which interposes a layer made of an adhesive agent which is placed between (a) multiple reinforcing layers; and (b) these reinforcing layers and an interior layer and an exterior layer which are configured of a thermoplastic resinous material. The aforementioned reinforcing layer has a spiral structure. Further, the reinforcing layer is either untwisted or soft twist fiber and the twist count is set at 10 times / 10 cm and under.

[0006] The present invention is configured as indicated above, namely the buckling generation point is reduced by using an integrated structure made of multiple reinforcing layers and the space between these multiple reinforcing layers and the interior and exterior resinous layers via a layer made of an adhesive agent. The reinforcing layer is made so that it has a spiral structure. The contact points between the filaments in the reinforcing fibers are small so that the buckling generation points are reduced. As a result, it is possible to effectively prevent the main body of the hose from buckling while the hose is being assembled and at the same time to upgraded the reinforcing efficiency making possible high-speed movement of the braiding machine possible so that the productivity is improved.

[0007]
[Working of the Invention] Next, we shall describe a working of the present invention based on the attached diagrams. Figure 1 is an inclined view of a partial cutaway of the main body of the hose 5 which is a working of the present invention. This main body of the main body 5 is formed of two reinforced layers, layer 8a and layer 8b which has a spiral structure which is made up of an untwisted or soft twist polyester fiber thread with a twist count of 10 time / 10 cm and under which are placed between (1) an interior layer 6 which is made of a thermoplastic polyester elastomer or other thermoplastic resinous material; and (2) an exterior layer 7 which is made up of a thermoplastic polyurethane, thermoplastic polyester elastomer or other type of thermoplastic resinous material.

[0008] Further, the Shore D hardness which is preferable for thermoplastic resinous fibers should be within the range of 40 to 63 for the interior layer and within the range of 32 to 50 for the exterior layer. The present invention is configured of a single integral piece in which a layer 9 made up of a polyurethane group adhesive agent is interposed between reinforcing layers 8a and 9b and these reinforcing layers 8a and 8b and interior layer 6 and exterior layer 7.

[0009] Further, although the two reinforcing layers 8a and 8b are set in place between the interior layer 6 and the exterior layer 7 in this working of the present invention, three or more reinforcing layers may be set in place using the layer 9 made of the adhesive agent. Further, when the twist count of the fibers in the aforementioned reinforcing layers 8a and 8b exceeds 10

count / 10 cm, the degree of flatness of the fiber bundle declines. The distance between the reinforcing layers 8a and 8b and between these reinforcing layers 8a and 8b and the interior layer 6 or the exterior layer 7 gradually increases, the adhesive strength between these gradually weakens and it assumes an undesirable shape. As a result, the twist count of the fibers should be 10 times / 10 cm and under.

[0010] Next, we shall describe (1) the hose which is provided with the braided structure reinforcing layer in the prior art; (2) bending tests which were carried out on the hose in the present invention which has reinforced layers with a spiral structure; and (3) the results of those tests.

[Experimental Conditions]

1. Specifications for hose

(a). inner diameter : 5.0 mm; outer diameter: 9.0 mm

(b). hose material

Interior layer: thermoplastic polyester elastomer (Shore D hardness of 55° to 47°)

Exterior layer: thermoplastic polyurethane (Shore D hardness of 40°) or thermoplastic polyester elastomer (Shore D hardness of 40°)

Reinforcing threads: polyester fiber thread (1,500 d) with a twist count of 5 (times / 10 cm)

Adhesive agent: polyurethane group adhesive agent (TB : 40 Kgf / cm^2, breaking elongation: 380 %)

Braiding angle of reinforcing layers: 109° 30'

Braided structure: 24 c x 2P, (72,000d)

Spiral structure: 24 c x 1P x 2 layers (72,000d)

Interior layer dimensions: Φ 5.0 (inner diameter) x 1.0 t (thickness) x Φ 7.0 (outer diameter)

Exterior layer dimensions: 1.0 t (thickness) x Φ 9.0 (outer diameter)

2. Test results

Results of the bending tests carried out on the hose are indicated in Table 1.

[0011]

[Table 1] [Translator's note: please see last page for Table]

[0012] The bending tests carried out on the hose were carried out as follows. A test hose was placed horizontally between 50 mm supporting points P, as indicated in Figure 4 (a) through Figure 4 (c). A load is placed at the center between the supporting points vertically using the pressing pressure bar Z from standard position X---X. The buckling point S (distance) up until the time the hose buckles is indicated in Figure 4 (c).

[0013] As can be seen from the measuring results, the point where buckling occurs becomes smaller by integrating multiple reinforcing layers and these multiple reinforcing layers and interior and exterior layers using a layer made of an adhesive agent. The reinforcing layers have a spiral structure and the contact points between the filament of the reinforcing fiber are smaller so that the buckling generation points become smaller.

[0014] The present invention is configured by integrating multiple reinforcing layers and these multiple reinforcing layers and interior and exterior resinous layers using a layer made of an

adhesive agent so that the buckling generation points are smaller. By giving the reinforcing layers a spiral structure, the contact points of the filaments of the reinforcing fibers become smaller so that the buckling generation points become smaller. As a result, it is possible to effectively prevent buckling from occurring on the main body of the hose while the hose is being assembled and at the same time to upgrade the reinforcing efficiency and further to make high-speed motions for the braiding machine possible so that the productivity is upgraded.

[Brief Explanation of Figures]

[Figure 1] This is an inclined partial cutaway view of the main body of the hose which is a working of the present invention.

[Figure 2] This is a sectional view along arrows A—A in Figure 1

[Figure 3] This is an inclined partial cutaway view of the hose which is provided with the prior art braided reinforcing layer.

[Figure 4] (a) through (c) are explanatory diagrams of the bending tests carried out on the hose.

[Explanation of Numerals]

5... main body of hose
6...interior layer
7...exterior layer
8a, 8b....reinforcing layers
9..layer made of adhesive agent

[Captions for Figures]

[Figure 1]	**[Figure 2]**	**]Figure 3]**
[no text]	[no text]	[no text]

[Figure 4]
[no text]

Table 1

	Comparative Example	Practical Embodiment 1	Practical Embodiment 2	Practical Embodiment 3	Practical Embodiment 4
Structure of reinforcing layer	braided	spiral	spiral	spiral	spiral
Interior layer material, Shore D hardness	polyester (55 °)	polyester (55 °)	polyester (55 °)	polyester (47 °)	polyester (47 °)
Exterior layer material, Shore D hardness	urethane (40 °)	urethane (40 °)	polyester (40 °)	urethane (40 °)	polyester (40 °)
Adhesive agent used on interior layer	yes	yes	yes	yes	yes
Adhesive agent used on reinforcing layer	yes	yes	yes	yes	yes
Adhesive agent used between reinforcing layers	not possible	yes	yes	yes	yes
Buckling point (mm)	21	40	42	41	44